

Line Intercept and Daubenmire Frame Method Directions

Equipment:

Tape, 50 m	Stakes for tape (at least two spikes; old, medium to large screwdrivers work well)
Daubenmire frame 20 x 50 cm	Meter stick (for measuring shrub and grass/forb heights)
Digital camera, extra camera battery	Photo cards and markers or small dry-erase board and marker
Topographic map with project area, general cover types, and pasture boundaries delineated	Aerial photographs
Ecological Site Guides	GPS unit, compass
Clipboard, data forms and/or data logger with extra battery, pencils	Calculator

Protocol:

- Seasonal habitat has been stratified by land cover types prior to field evaluation (see chapter II for more directions).
- Conduct an appropriate number of transects in each seasonal habitat by each land cover type. Repeat all steps for each transect.

- Complete all metadata information at the top of the appropriate field forms for each transect, making sure that the plot identification information (i.e., plot number) matches that recorded on the overall plot metadata form. If more than 25 Daubenmire plots are being recorded on a transect, attach additional forms as needed. Most of the information should be self-explanatory except the following:

Population: Identify the population with which the habitat is associated. This definition also includes small populations. Population names are found in figure 3.

Home Range Name: Identify the home range area using a major drainage area or other distinguishing land feature (e.g., Little Lost River home range).

Associated Leaks: List the two largest occupied leaks to which the breeding habitat is associated. Use identification numbers or names that are used in the statewide database.

Land Cover Type: Identify the cover type of the data collected. Use plant alliances or associations (Reid et al. 2002) for sagebrush or grassland communities; use www.natureserve.org/explorer (International Classification of Ecological Communities) or other sampling strata to describe the habitat (e.g., percent sagebrush categories). Use the species symbol for dominant species in the overstory and understory (table B-1), for example, ARTRW8 (alliance level – Wyoming big sagebrush) or ARTRW8/FEID (association level – Wyoming big sagebrush/Idaho fescue).

Ecological Site: Refer to soil maps, range site guides, and ecological site descriptions where available and record the appropriate ecological site. Use the species symbol for dominant species in the overstory and understory.

Seasonal Habitat: List one of the following: lek, nesting/early brood-rearing, summer/late brood-rearing, or winter.

Site Info:

Arid Site: Applies to sagebrush ecological sites generally in the 25–30 cm (~10–12 in) precipitation zone. Wyoming big sagebrush is a common big sagebrush subspecies for this type of site.

Mesic Site: Applies to sagebrush ecological sites generally in a >30 cm (12 in) precipitation zone. Mountain big sagebrush is a common big sagebrush subspecies for this type of site.

Transect #: Assign a unique identifier to each transect within the land cover type.

Area Sampled: Record the total area (indicating ha/ac) or distance for riparian areas (indicating km/mi) of the site type or land cover type sampled.

- Anchor the tape with a steel pin and pull the tape out 50 meters. Keep the tape as taught and straight as possible. Anchor the tape on the far end. For smaller cover type inclusions or stringers or other unique situations, the transect length may be increased or decreased, as appropriate, to adequately sample the site. This will necessitate modifying the sampling distance for Daubenmire frames along the tape to accommodate 25 frames.
- Begin at the “0” end of the tape.

4. On the data form, record **shrub cover** by species and subspecies using the line intercept method. Two forms are provided. The electronic version provides an example of data to be collected when using a laptop computer or data logger. The paper version is for collecting data via nonelectronic means.
 - a. For the entire length of the line, determine the *intercept length* of any shrub species that touches the line. Only live portions of the shrub canopy are recorded. Intercept length is the portion of the transect length intercepted by the shrub, measured by a perpendicular projection of the shrub foliage over the line (figure B-4).
 - b. List all cover increments for each species measured to the nearest 1 cm. Ignore spaces or gaps in the canopy *less than 5 cm* across. Gaps in the live canopy in excess of 5 cm *will not* be included as canopy intercepts (figure B-5). Record only live (leaves, live stems, and shrub trunk) canopy cover.

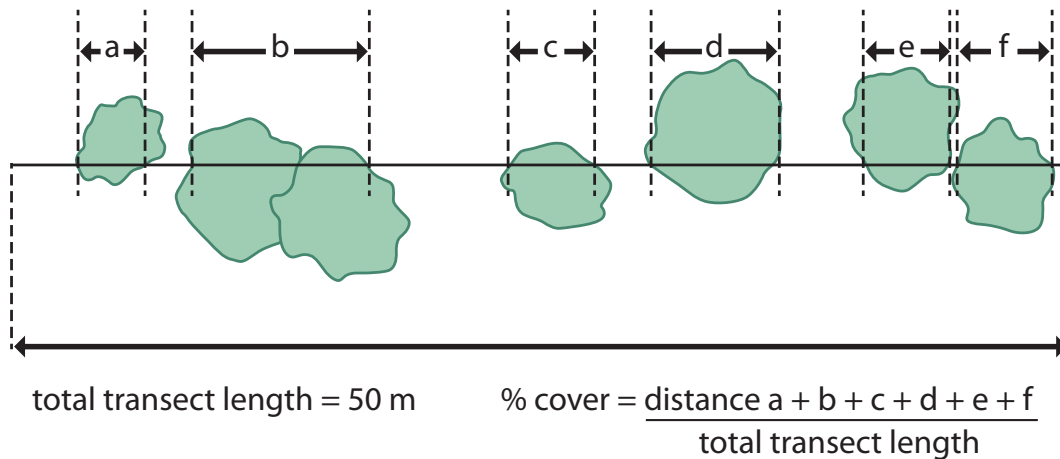


Figure B-4. The line intercept method can be used to measure canopy cover of sagebrush species.



Figure B-5. Measuring shrub canopy cover using the line intercept method. Group sagebrush with gaps smaller than 5 cm. Record sections of sagebrush separated by greater than 5 cm as separate intercepts.

5. Estimate **cover class** and **vegetation height** using the Daubenmire method at each 2-m increment ($n = 25$ plots per transect) along the tape:

- a. Place a 20 x 50 cm Daubenmire frame (figure B-6) along the tape with the long axis perpendicular to the tape (figure B-7). For each plot, estimate and record cover class for annual forbs, perennial forbs, annual grasses, and perennial grasses by species (based on Connelly et al. 2003):

Cover classes:	1 = 0-5%	midpoint of range 2.5%
	2 = >5-25%	midpoint of range 15%
	3 = >25-50%	midpoint of range 37.5%
	4 = >50-75%	midpoint of range 62.5%
	5 = >75-95%	midpoint of range 85%
	6 = >95-100%	midpoint of range 97.5%

- b. Count plants providing cover over the plot, regardless of if they are rooted in the plot or not.
- c. Record the height in cm of the nearest sagebrush plant (or other shrub species if no sagebrush is present) that is overhanging the Daubenmire frame.
- d. Record the shape of the nearest sagebrush plant that is overhanging the Daubenmire frame: S = spreading or C = columnar (figure 13).
- e. Record the maximum "natural" or "droop height" in cm of the tallest perennial grass and perennial forb overhanging the Daubenmire frame (natural = the highest point of a leaf or seed stalk is measured with no straightening by the observer (figure B-3). This includes seed stalks or inflorescences.

Daubenmire Frame/Six Cover Class Frame

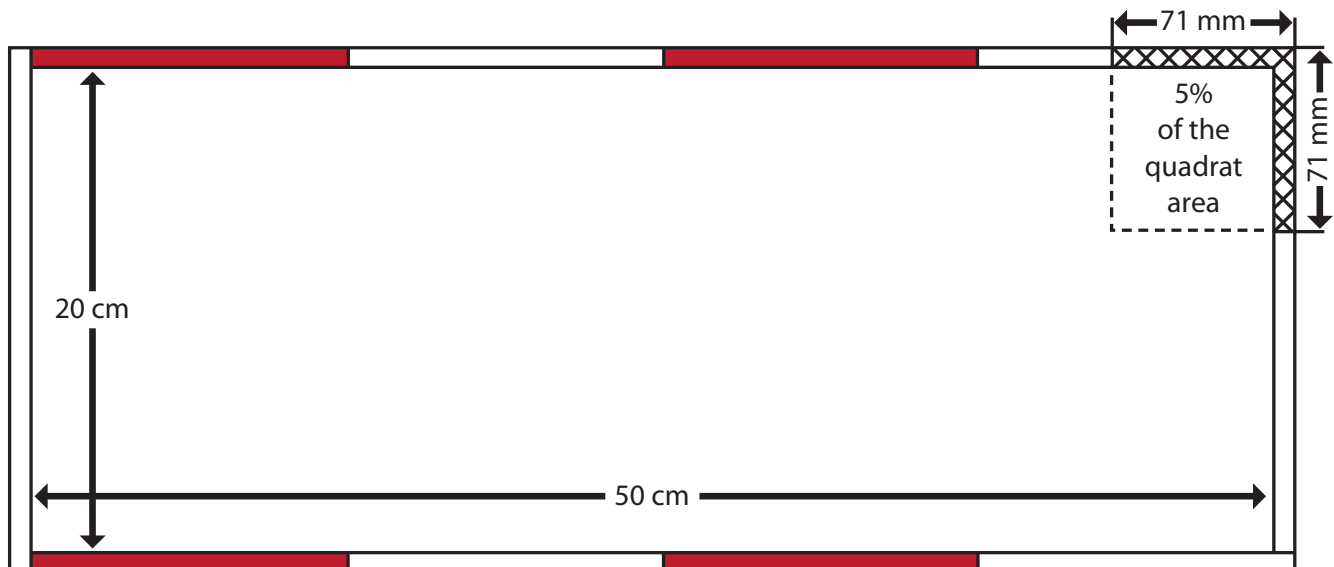


Figure B-6. The Daubenmire frame is used for estimating grass and forb canopy covers. Estimate canopy cover class of species rooted within or overhanging the frame using lines on the frame as guides.

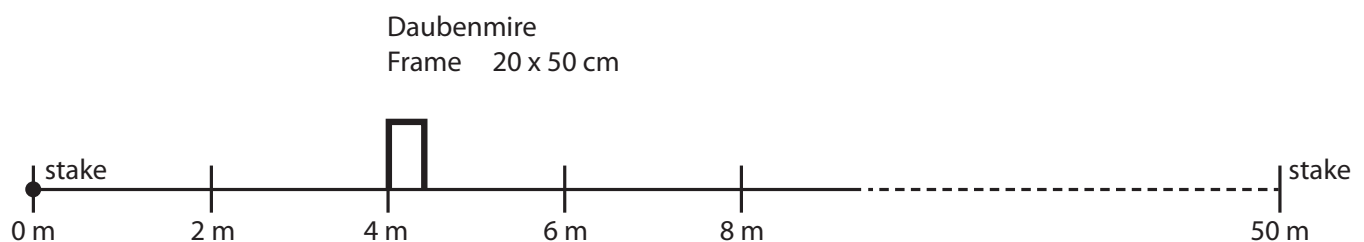


Figure B-7. A line transect with Daubenmire frames positioned every 2 meters.

6. Summarize the data under Line Intercept Shrub Cover:

a. **Shrub Species:**

- *Total* = sum of intercept lengths for each shrub species.
- *% Cover* = total shrub intercept length by species divided by full transect length.

b. **All Shrubs:**

- *% Cover* = sum of above % cover calculations by species. The total could exceed 100% if the intercepts of overlapping canopies are recorded.

7. Summarize the data at the top of the form:

a. **Shrubs:**

- *Sagebrush Cover: % Cover* = sum of % covers of all sagebrush species listed under Shrub Species in the Cover section.
- *Avg. Sagebrush Height* = sum of all sagebrush recorded heights divided by total number of sagebrush plants measured in the Vegetation Height section.
- *Sagebrush Shape* = total # of sagebrush plants of each shape, spreading (S) and columnar (C).
- *Other Shrub Cover: % Cover* = sum of % covers of all shrub species listed under All Shrubs in the Cover section.

b. **Forbs:**

- *Perennial Forb Cover: PF % Cover* = number of plots with perennial forbs in each of the six cover classes, multiplied by the midpoint of each cover class, added together as the sum of products for all cover classes, divided by total number of plots sampled on the transect (e.g., [(15 plots in cover class 1 * 2.5 midpoint) + (10 plots in cover class 2 * 15 midpoint)] / 25 = 7.5% canopy cover).
- *Annual Forb Cover: AF % Cover* = number of plots with annual forbs in each of the six cover classes, multiplied by the midpoint of each cover class, added together as the sum of products for all cover classes, divided by total number of plots sampled on the transect (e.g., [(15 plots in cover class 1 * 2.5 midpoint) + (10 plots in cover class 2 * 15 midpoint)] / 25 = 7.5% canopy cover).
- *Total Forb Cover: PF+AF % Cover* = sum of PF % Cover and AF % Cover (e.g., 7.5 + 7.5 = 15% canopy cover).
- *Avg. PF Height* = sum of all perennial forb heights recorded divided by the total number of perennial forb plants measured. Relative to perennial forbs, the suitability rating should focus on the cover estimates and preferred forb availability ratings rather than on height due to the variability in heights that can be encountered between forbs and grasses. However, average perennial forb height and/or average perennial forb and grass height (combined) can be calculated, if desired, to provide additional context to the description of the assessment area.

c. **Grasses:**

- *Perennial Grass Cover: PG % Cover* = number of plots with perennial grasses in each of the six cover classes, multiplied by the midpoint of each cover class, added together as the sum of products for all cover classes, divided by total number of plots sampled on the transect.
- *Annual Grass Cover: AG % Cover* = number of plots with annual grasses in each of the six cover classes, multiplied by the midpoint of each cover class, added together as the sum of products for all cover classes, divided by total number of plots sampled on the transect.
- *Total Grass Cover: PG+AG % Cover* = sum of PG % cover and AG % cover.
- *Avg. PG Height* = sum of all perennial grass recorded heights divided by total number of perennial grass plants measured.
- *Sandberg bluegrass (or similar species):*

1. Summarize cover and height for perennial grasses, excluding Sandberg bluegrass, or similar short-statured perennial grasses.
2. Summarize cover and height for Sandberg bluegrass.
3. Summarize cover and height inclusive of all perennial grasses.

Because shorter-statured perennial grasses such as Sandberg bluegrass may influence cover and height averages especially where abundant, the authors recommend that perennial grass metrics be summarized using all three methods to provide additional context for the perennial grass suitability rating. For example, if cover and height for perennial grasses, excluding Sandberg bluegrass (#1), are within the range of the suitable category in the HAF, then consider a ranking of "suitable" for the perennial grass indicator. However, if average cover (regardless of height) of these perennial grasses is not within the suitable category, use the cover and height averages for all perennial grasses, including Sandberg bluegrass (#3). Then, use the cover and height averages for the non-Sandberg perennial grasses (#1), as well as for Sandberg bluegrass itself (#2), to inform the rationale for the rating of the perennial grass indicator. Also, consider the capability of the site to provide species composition, cover, and structure for productive sage-grouse habitat on an annual basis.

8. **OPTIONAL:** Complete the "Sage-Grouse Forb Diversity Data Form," or use the forb data collected in the Daubenmire frame to compile forb information for the site. Later, write a short narrative describing forb diversity relative to the site.

9. OPTIONAL: Record ground cover at each of the four outside corners of the Daubenmire frame in the four ground cover cells for each plot. See the codes below:

G = gravel (≤ 5 mm or $\sim 1/4$ in)

R = rock (> 5 mm or $\sim 1/4$ in)

BR = bedrock

D = duff (when there is no clear boundary between litter and mineral soil and litter is not removed during typical storms (occurring annually))

M = moss

LC = visible lichen crust on soil

S = soil

L = herbaceous litter (≤ 5 mm or $\sim 1/4$ in; defined as detached stems, roots, and leaves)

WL = woody litter (> 5 mm or $\sim 1/4$ in)

EL = embedded litter (where removal of the litter would leave an indentation in the soil surface or would disturb the soil surface, breaking the soil crust)

V = live vegetation